Red River Waterway Project
Shreveport, LA, to Daingerfield, TX, Reach
Reevaluation Study In-Progress Review

GEOTECHNICAL INVESTIGATIONS

PREFACE

1. In October 1988 (Fiscal Year 1989), the U.S. Army Corps of Engineers, Vicksburg District, was directed by Congress to initiate a reevaluation of the feasibility of the Shreveport, LA, to Daingerfield, TX, reach of the Red River Waterway Project. Subsequent funding was provided by Congress in Fiscal Years 1990-1993.

2. In December 1992, an in-progress review of the feasibility of extending navigation on the Shreveport to Daingerfield reach was completed. The review was a preliminary assessment of project costs, benefits, and environmental impacts. The review revealed that construction of this reach of the project was not economically feasible. The project was also found to result in significant environmental impacts for which mitigation was not considered to be practicable. The reevaluation studies were terminated as a result of the in-progress review.

3. Various documents are available so that the public can better understand the results of the reevaluation study. The documents are:

a. In-Progress Review Documentation prepared in December 1992 for headquarters review.

b. Environmental Summary.

c. Regional Economic Development.

d. Public Involvement.

e. Recreation.

f. Mussel Survey.

g. Historic Watercraft Survey.

h. Geotechnical Investigations.

i. Geomorphic Investigations.

Copies of all these documents have been placed in the local depositories listed in the Public Involvement documentation. Copies can be obtained from the Vicksburg District for the cost of reproduction.

4. The geotechnical investigations were conducted by the Vicksburg District. The purpose of the investigations was to gather data required for the foundation design of navigation structures, locks, dams, etc., and the navigation channel.

RED RIVER WATERWAY PROJECT
SHREVEPORT, LA, TO DAINGERFIELD, TX, REACH
REEVALUATION STUDY IN-PROGRESS REVIEW

GEOTECHNICAL INVESTIGATIONS

Table of Contents

LIST OF PLATES

LIST OF PLATES

RED RIVER WATERWAY
SHREVEPORT, LA, TO DAINGERFIELD, TX, REACH
REEVALUATION STUDY, IN-PROGRESS REVIEW

GEOTECHNICAL INVESTIGATIONS

GENERAL

1. The project area is located in northeast Texas and northwest Louisiana and includes Twelvemile Bayou, Caddo Lake, Big Cypress Bayou, Lake O' The Pines and the areas along and adjacent to these streams and lakes. The total length of the project is 76 miles.

FIELD INVESTIGATIONS

2. A total of 26 borings were drilled for the Shreveport to Daingerfield Study. There were 17 channel borings and 9 structure borings. There were 12 cone penetrometer tests (CPT's) obtained at the three structure sites. Boring and CPT locations are shown on Plate 1 and boring profiles on Plates 2 through 4. Cone plots are shown in the Appendix. A boring legend is presented on Plate 5.

3. Borings were sampled at 5-foot intervals or stratum change, whichever was less. Undisturbed samples in cohesive materials were obtained using a 5-inch I.D. vacuum type Shelby tube sampler. Samples in granular soils were obtained using a 2.5-inch diameter drive tube or a split spoon sampler.

GEOLOGY

Location

4. The.Red River Waterway, Shreveport, LA, to Daingerfield, TX, is a reach of the Red River Waterway Project authorized by the River and Harbor Act of 1968, Public Law 90-483, approved 13 August 1968. This portion of the waterway begins just north of the Interstate 220 bridge in Shreveport, LA, via an overland cut into Twelvemile Bayou, and extends along Twelvemile Bayou through Caddo Lake and along Cypress Bayou to a turning basin in Lake 0' The Pines (Ferrells Bridge Dam) near Daingerfield, TX. All of the project area is located in the Big Cypress Bayou Drainage Basin in northeast Texas and northwest Louisiana.

Geologic Mapping

5. The U.S. Army Corps of Engineers, Vicksburg District, contracted with Waterways Experiment Station to develop a series of geologic maps for the project area. These maps can be found in the CEWES Technical Report (GL-92-l) dated February 1992 which has previously been placed in the local study depositories. The geologic maps show the different patterns of alluvium and Tertiary formations which have been deposited or outcrop throughout the proposed project reach. The maps also describe the different lithologies associated with these units as well as characterizing the environments of deposition for the recent alluvium. The report gives a general overview of the geohydrology that can be expected from the different subsurface groups and formations. Cross sections have also been included which show the association and varying thicknesses for the topstratum and substratum alluvium as well as the depths to the upper boundaries for the Tertiary formations which subcrop beneath the overlying sediment.

Geology

6. Physiographically, the Shreveport to Daingerfield project area lies in the West Gulf Coastal Plain Province in what is recognized as the East Texas Embayment. This region is typified by low elevations and gradual relief. The study area lies within the Big Cypress Bayou and Red River drainage basins. Here, the ground surface elevations average 175 feet, National Geodetic Vertical Datum (NGVD), with. relief varying between 25 to 50 feet, NGVD. Occasional bluffs adjacent to the flood plain levels may result in slightly more relief in some areas.

7. The sediments of the study area are of Quaternary and Tertiary age and represent periods of both fluvial and marine deposition. The environments of deposition for the formations outcropping in the Shreveport to Daingerfield Study area range from shallow marine through deltaic and coastal to terrestrial. The Quaternary and Tertiary units forming the outcrop pattern for the study area include from youngest to oldest, alluvial, Sparta (sand), Weches, Queen City (sand), Reklaw and Carrizo (sand) Formations and the Wilcox Group. The youngest Tertiary outcrop material is found in the northwest and the oldest Tertiary outcrop material is found in the southeast sections of the project boundaries. This reversal in trend, from younger to older units gulfward, is due to the late Cretaceous volcanically originated Sabine uplift. The most important structural features in this area are the East Texas Syncline, Sabine Uplift, and the Rodessa Fault. The East Texas Syncline is a broad structural downwarping which trends generally northeast-southwest and whose axis lies just north of the project area. The Sabine Uplift is a

structural high whose northwest flank borders the lower portion of the study reach. Both these features have affected the dip and thickness of the local strata. Consequently, the geologic units, except the Quaternary deposits, generally dip and thicken northwest toward the axis of the East Texas Basin. The Rodessa Fault which trends northeasterly through Jefferson has caused vertical displacement ranging from 0-200 feet in the Tertiary formations in this portion of the project area.

8. The geologic units pertinent to the ground water in the report area range in age from Paleocene to Recent with the principal source of ground water being the geologic units of Eocene age. The geologic units, their thickness, lithology, age, and water-bearing properties are summarized in Table 2. Units of the Wilcox Group plus the Carrizo (sand), and the Reklaw and the Queen City (sand) Formations form what is locally known as the Cypress Aquifer. This aquifer is the predominant source for water in the study area. Also, and in ascending order above the Queen City (sand) are the Weches (greensand) and the Sparta (sand), which occur only as outliers capping some of the ridges in the project area. These units yield only small amounts of ground water to shallow wells.

9. The alluvium in the Big Cypress and Red River Valleys was deposited by Big Cypress Bayou and the Red River unconformably on an eroded Tertiary surface. The alluvium consists of a fining upward sequence of gravel, sand, silt, and clay. The alluvium in the valley of Big Cypress Bayou ranges from 20 to 50 feet in thickness while along Twelvemile Bayou in the Red River Valley it thickens from 50 to 70 feet. The basal sand and gravel in the alluvium form the alluvial aquifer in the study area. Ground water from the alluvial aquifer is not heavily utilized for domestic or agricultural uses in the project area.

SOILS

General

10. The soils investigation for the Shreveport to Daingerfield Study consisted of field exploration, laboratory testing, and analytical study. For the purpose of the foundation study the area was divided into four reaches: Twelvemile Bayou, Goose-Prairie Cutoff, Pool 6 (Big Cypress Bayou), and Pool 7 (Lake O' The Pines).

Laboratory Testing

11. Laboratory testing consisted of visual classification of all samples, water content determination on clays and silt, Atterberg limits, grain-size analyses on sands and unconfined compression

tests on select clay undisturbed samples. The tests were performed by the Vicksburg District Soils Laboratory. Test data summary sheets are presented on Plates 10 and 11.

Design Shear Strengths

12. Clays. Undrained shear strengths for clays were determined from the results of'unconfined compression test.

13. Silts and Sands. Design shear strengths for silts and sands were based on prior experience with these type of soils located in the study area. A "R" strength of ϕ = 20 degrees and c = 300 psf were used for silts, while a "S" strength of ϕ = 30 degrees and c = 0 were used for sands. A "S" strength of ϕ = 33 degrees and c = 0 were used for tertiary sands.

Stability Analyses

14. General. Stability analyses were performed for the four reaches. All slope stability analyses for the channel sections were performed for the end-of-construction and sudden-drawdown cases using CEWES Computer Program SSW028, Slope Stability, Wedge Method.

15. Stability Sections. A discussion of each stability analysis is presented below. Only the most critical wedges have been discussed and shown.

a. Reach 1 - Twelvemile Bayou. The strengths and stratifications from boring STD-l0-91U were used for the analysis at this location. The lowest factor of safety with a 1 on 3 side slope was 1.29 for after construction and 1.68 for sudden drawdown. The results of this analysis are presented on Plate 6.

b. Reach 2 - Goose-Prairie Cutoff. The strengths and stratifications from boring STD-13-91U were used for the analysis at this location. The lowest factor of safety with a 1 on 3 side slope was 1.75 for after construction and 1.26 for sudden drawdown. The results of this analysis are presented on Plate 7.

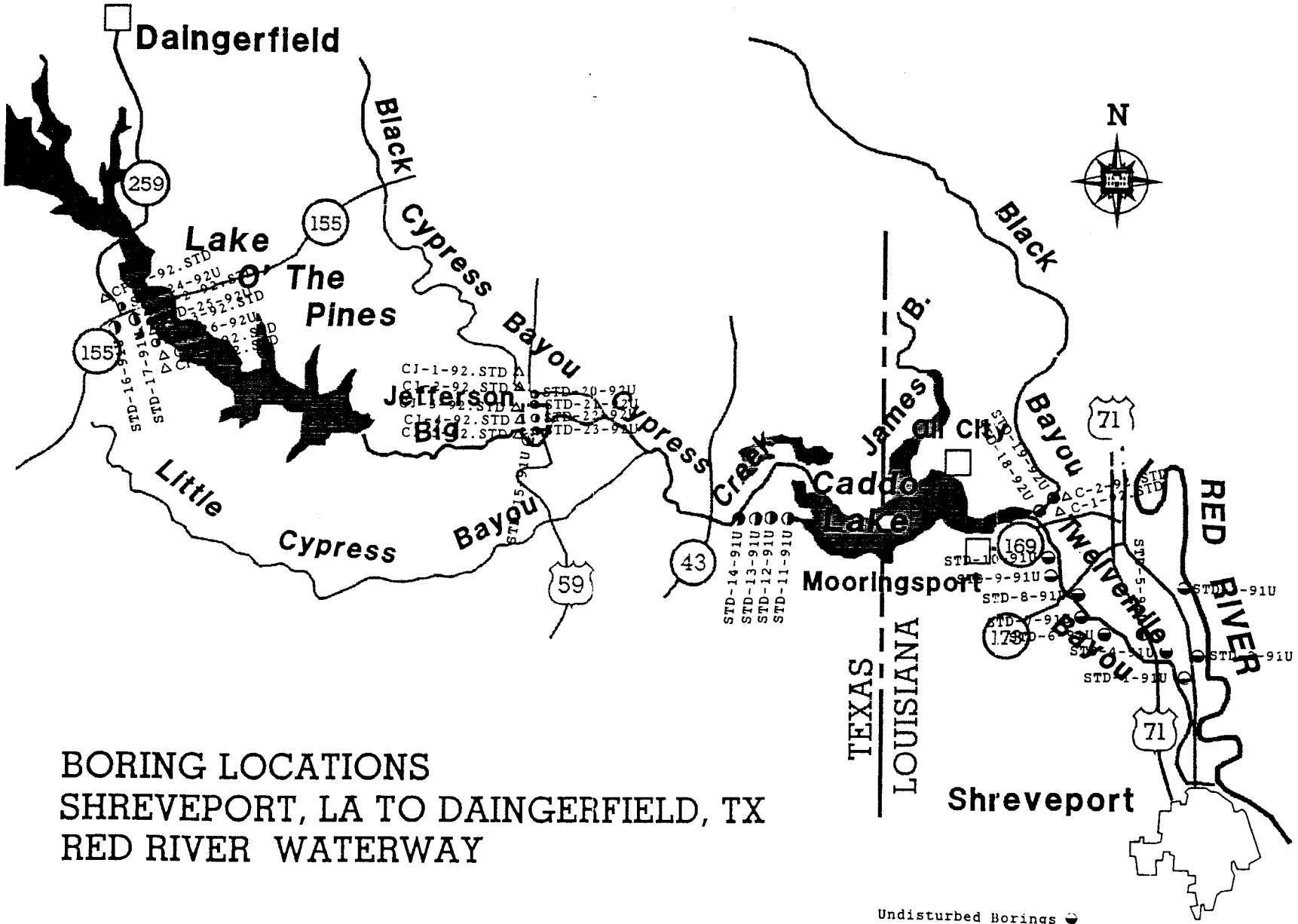
c. Reach 3 - Pool 6. The strengths and stratifications from boring STD-15-91U were used for the analysis at this location. The lowest factor of safety with a 1 on 3 side slope was 1.77 for after construction and 1.30 for sudden drawdown. The results of this analysis are presented on Plate 8.

d. Reach4 - Poo17. The strengths and stratifications from boring STD-17-91U were used for the analysis at this location. The lowest factor of safety with a 1 on 4 side slope was

2.10 for after construction and 1.20 for sudden drawdown. A 1:3 slope was inadequate during sudden drawdown analysis. The results of this analysis are presented on Plate 9.

Structures

16. There were three proposed structure sites, lock at Caddo Lake Dam; lock and dam at Jefferson, TX; and lock at Ferrells Bridge Dam, Lake O' The Pines. The structures at Caddo, Jefferson and Lake O' The Pines are founded on tertiary clays. The structure excavation at Caddo is down to elevation 109 and tertiary is at elevation 137. The lowest structure excavation at Jefferson is elevation 130 and tertiary is 140. The lowest structure excavation at Lake O' The Pines is elevation 144 and tertiary clay is at elevation 192.



BORING LOCATIONS
SHREVEPORT, LA TO DAINGERFIELD, TX
RED RIVER WATERWAY

PLATE NO. 1

STD-1-91U
SEE MAP
FIELD BOOK NO. - 7520
3 SEP 91

STD-2-91U
SEE MAP
FIELD BOOK NO. - 7521
4 SEP 91

STD-3-91U
SEE MAP
FIELD BOOK NO. - 7521
11 SEP 91

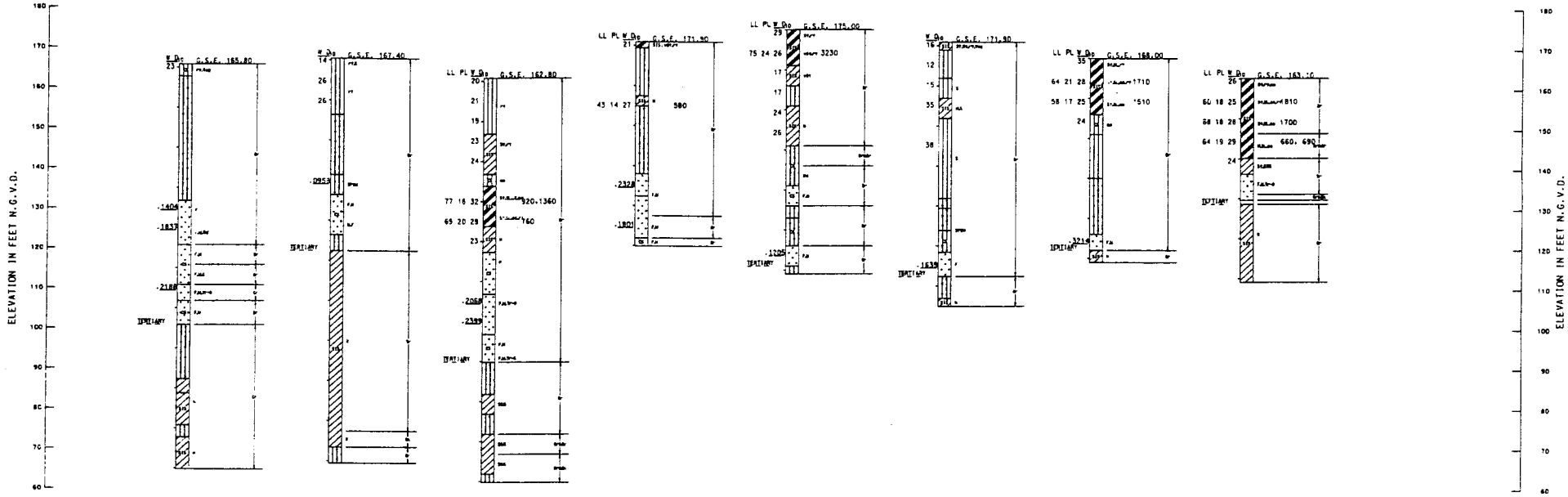
STD-4-91U
SEE MAP
FIELD BOOK NO. - 7521
10 SEP 91

STD-5-91U
SEE MAP
FIELD BOOK NO. - 7521
10 SEP 91

STD-6-91U
SEE MAP
FIELD BOOK NO. - 7522
1 OCT 91

STD-7-91U
SEE MAP
FIELD BOOK NO. - 7521
13 SEP 91

STD-8-91U
SEE MAP
FIELD BOOK NO. - 7521
12 SEP 91



Notes: Borings made by rotary drilling method with mud.
General samples were taken with a 2.5 inch drive tube.
Undisturbed samples were taken with a 5 inch vacuum tube.

SHREVEPORT-DAINGERFIELD
CHANNEL BORINGS

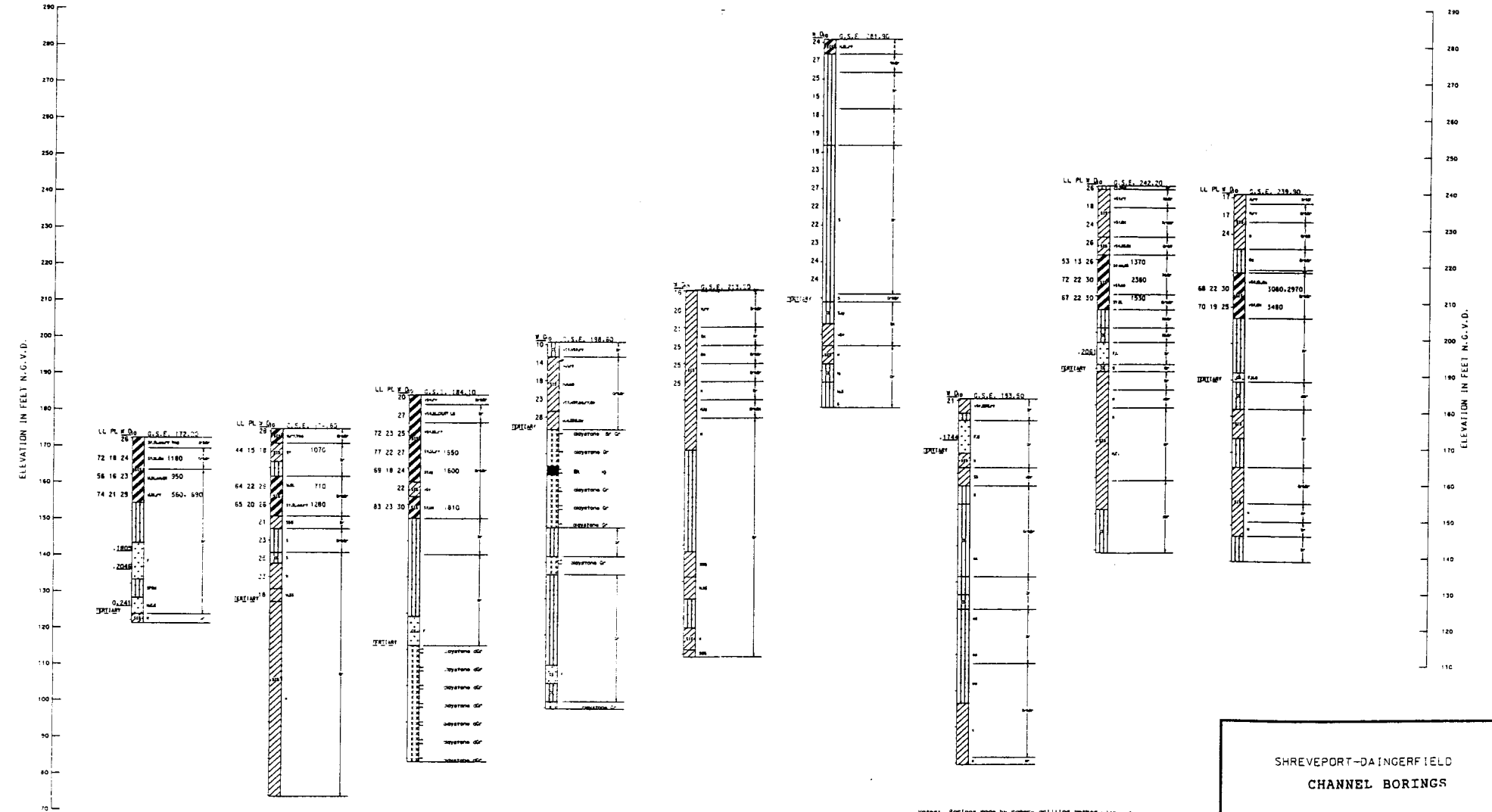
SCALE AS SHOWN
U.S. ARMY ENGINEER DISTRICT, VICKSBURG
CORPS OF ENGINEERS
VICKSBURG, MS

DATE:

FILE NO.

PLATE NO. 2

STD-9-91U	STD-10-91U	STD-11-91U	STD-12-91U	STD-13-91U	STD-14-91U	STD-15-91U	STD-16-91U	STD-17-91U
SEE MAP	SEE MAP	SEE MAP	SEE MAP	SEE MAP	SEE MAP	SEE MAP	SEE MAP	SEE MAP
FIELD BOOK NO. - 7521 14 SEP 91	FIELD BOOK NO. - 7521 17 SEP 91	FIELD BOOK NO. - 7522 30 SEP 91	FIELD BOOK NO. - 7521 20 SEP 91	FIELD BOOK NO. - 7521 19 SEP 91	FIELD BOOK NO. - 7521 17 SEP 91	FIELD BOOK NO. - 7520 21 AUG 91	FIELD BOOK NO. - 7520 19 AUG 91	FIELD BOOK NO. - 7519 15 AUG 91



Notes: Borings made by rotary drilling method with mud.
General samples were taken with a 2.5 inch drive tube.
Undisturbed samples were taken with a 5 inch vacuum tube.

SHREVEPORT-DAINGERFIELD

CHANNEL BORINGS

SCALE AS SHOWN
U.S. ARMY ENGINEER DISTRICT, VICKSBURG
CORPS OF ENGINEERS
VICKSBURG, MS

DATE

FILE NO.

PLATE NO. 3

STD-18-92U
AS ON MAP
FIELD BOOK NO. - 7601
16 NOV 92

STD-19-92
AS ON MAP
FIELD BOOK NO. - 7602
17 NOV 92

STD-20-92U
AS ON MAP
FIELD BOOK NO. - 7601
28 OCT 92

STD-21-92
AS ON MAP
FIELD BOOK NO. - 7601
2 NOV 92

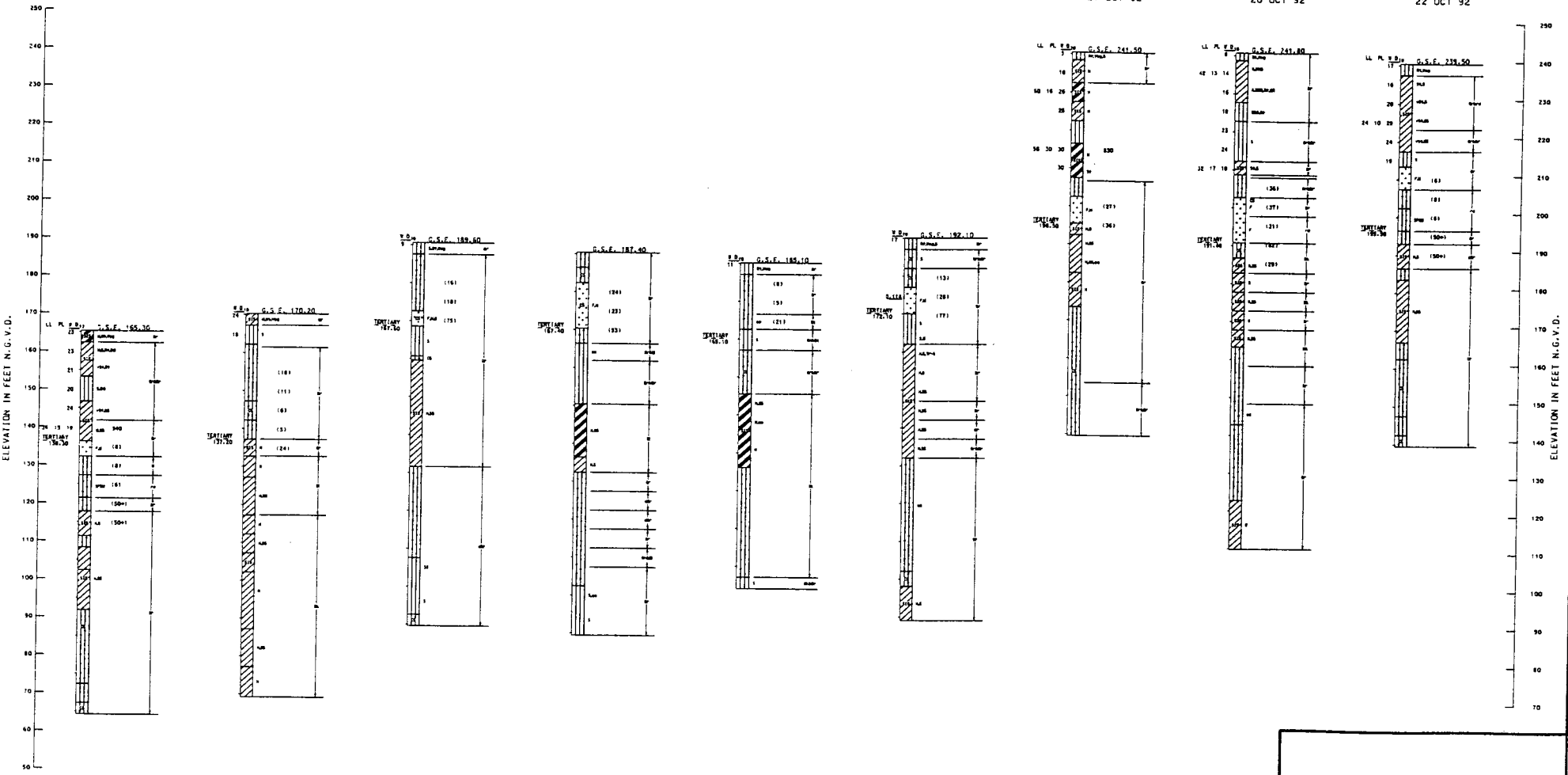
STD-22-92U
AS ON MAP
FIELD BOOK NO. - 7601
4 NOV 92

STD-23-92U
AS ON MAP
FIELD BOOK NO. - 7601
5 NOV 92

STD-24-92U
AS ON MAP
FIELD BOOK NO. - 7602
27 OCT 92

STD-25-92U
AS ON MAP
FIELD BOOK NO. - 7601
20 OCT 92

STD-26-92U
AS ON MAP
FIELD BOOK NO. - 7601
22 OCT 92



Notes: Borings made by rotary drilling method with mud.
General samples were taken with a 2.5 inch drive tube.
Undisturbed samples were taken with a 3 inch vacuum tube.

SHREVEPORT-DAINGERFIELD

STRUCTURE BORINGS

SCALE AS SHOWN
U.S. ARMY ENGINEER DISTRICT, VICKSBURG
CORPS OF ENGINEERS
VICKSBURG, MS

DATE:

FILE NO:

PLATE NO. 4

UNIFIED SOIL CLASSIFICATION

MAJOR DIVISION		TYPE	LETTER SYMBOL	SYMBOL	TYPICAL NAMES
COARSE - GRAINED SOILS (More than half of material is larger than No. 200 sieve size)	GRAVELS (More than half of coarse fraction is larger than No. 4 sieve size)	CLEAN GRAVEL (Little or no fines)	GW		GRAVEL, Well Graded, gravel-sand mixtures, little or no fines
			GP		GRAVEL, Poorly Graded, gravel-sand mixtures, little or no fines
		GRAVEL WITH FINES (Appreciable Amount of Fines)	GM		SILTY GRAVEL, gravel-sand-silt mixtures
			GC		CLAYEY GRAVEL, gravel-sand-clay mixtures
	SANDS (More than half of coarse fraction is smaller than No. 4 sieve size)	CLEAN SAND (Little or no Fines)	SW		SAND, Well-Graded, gravely sands
			SP		SAND, Poorly-Graded, gravely sands
		SANDS WITH FINES (Appreciable Amount of Fines)	SM		SILTY SAND, sand-silt mixtures
			SC		CLAYEY SAND, sand-clay mixtures
FINE - GRAINED SOILS (More than half of the material is smaller than No. 200 sieve size)		SILTS AND CLAYS (Liquid Limit less than 50)	ML		SILT & very fine sand, silty or clayey fine sand or clayey silt with slight plasticity
			CL		LEAN CLAYS Sandy Clays Silty Clays of low to medium plasticity
			OL		ORGANIC SILTS and organic silty clays of low plasticity
		SILTS AND CLAYS (Liquid Limit greater than 50)	MH		SILT, fine sandy or silty soil with high plasticity
			CH		FAT CLAY, inorganic clay of high plasticity
			OH		ORGANIC CLAYS of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS			Pt		PEAT, and other highly organic soil
WOOD			Wd		WOOD
NO SAMPLE					

NOTE: Soils possessing characteristics of two groups are designated by combinations of group symbols

A comma will be used between modification symbols. Example. So,Gr.w/SIS.(CH)

NOTES:
FIGURES TO LEFT OF BORING UNDER COLUMN "W OR D_{10}" *
Are natural water contents in percent dry weight
When underlined denotes D_{10} size in m m *
FIGURES TO LEFT OF BORING UNDER COLUMNS "LL" AND "PL"
Are liquid and plastic limits, respectfully
SYMBOLS TO LEFT OF BORING
▽ Ground - water surface and date observed
(C) Denotes location of consolidation test **
(S) Denotes location of consolidated - drained direct shear test **
(R) Denotes location of consolidated - undrained triaxial compression test **
(Q) Denotes location of unconsolidated - undrained triaxial compression test **
(T) Denotes location of sample subjected to consolidation test and each of the above three types of shear test **
FW Denotes free water
FIGURES TO RIGHT OF BORING
Are values of cohesion in lbs./sq. ft from unconfined compression test
In parenthesis are driving resistances in blows per foot determined with a standard split spoon sampler (1⅜" I.D., 2" O. D.) and a 140 lb. driving hammer with a 30" drop
Where underlined with a solid line denotes laboratory permeability in centimeters per second of undisturbed sample
Where underlined with a dashed line denotes laboratory permeability in centimeters per second of sample remolded to the estimated natural void ratio

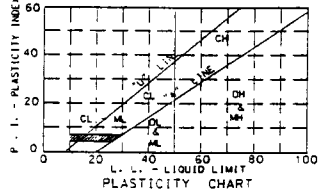
* The D_{10} size of a soil is the grain diameter in millimeters of which 10% of the soil is finer, and 90% coarser than D_{10}.

**Results of these test are available for inspection in the U.S. Army Engineer District Office. If these symbols appear beside the boring logs on the drawings.

DESCRIPTIVE SYMBOLS

COLOR	
COLOR	SYMBOL
TAN	T
YELLOW	Y
RED	R
BLACK	BK
GRAY	GR
LIGHT GRAY	lGr
DARK GRAY	dGr
BROWN	Br
LIGHT BROWN	lBr
DARK BROWN	dBr
BROWNISH - GRAY	br Gr
GRAY(ISH - BROWN)	gy Br
GREENISH - GRAY	gn Gr
GRAY(ISH - GREEN)	gy Gn
GREEN	Gn
BLUE	Bl
BLUE - GREEN	Bl Gn
WHITE	Wh
MOTTLED	Mot
REDDISH	rd

CONSISTENCY FOR COHESIVE SOILS		
CONSISTENCY	COHESION IN LBS./SQ. FT. FROM UNCONFINED COMPRESSION TEST	SYMBOL
VERY SOFT	< 250	vSo
SOFT	250 - 500	So
MEDIUM	500 - 1000	M
STIFF	1000 - 2000	St
VERY STIFF	2000 - 4000	vSt
HARD	> 4000	H



PLASTICITY CHART

For classification of fine - grained soils

MODIFICATIONS		MODIFICATIONS	
MODIFICATION	SYMBOL	MODIFICATION	SYMBOL
Trace	Tr	Sandy Silt strata	SSlS
Fine	F	Silty Sand strata	SlSS
Medium	M	With	w/
Coarse	C	Dense	D
Concretions	cn	Very Dense	vD
Roots	rt		
Lignite fragments	lg		
Shale fragments	sh		
Sandstone fragments	sds		
Shell fragments	slf		
Organic matter	O		
Clay strata or lenses	CS		
Silt strata or lenses	SlS		
Sand strata or lenses	SS		
Sandy	S		
Gravely	G		
Boulders	B		
Slickensides	SL		
Wood	wd		
Oxidized	Ox		
Crumbly	Cr		
Loose	Lo		
Vegetation	Veg		

GENERAL NOTES

1. While the borings are representative of subsurface conditions at their respective locations and for their respective vertical reaches, local variations characteristic of the subsurface materials of the region are anticipated and, if encountered, such variations will not be considered as differing materially within the purview of clause 4 of the contract.

2. "Ground water elevations shown on the boring logs represent ground water surfaces encountered in such borings on the dates shown. Absence of water surface data on certain borings indicates that no ground water data are available from the boring but does not necessarily mean that ground water will not be encountered at the locations or within the vertical reaches of such borings.

3. Consistency of cohesive soils shown on the boring logs is based on driller's log and visual examination and is approximate, except within those vertical reaches of the borings where shear strengths from unconfined compression test are shown.

4. The detailed explanation of the Unified Soil Classification System is presented in MIL-STD-619B, 12 June 1968, entitled "Military Standard Unified Soil Classification System for Roads, Airfields, Embankments and Foundations."

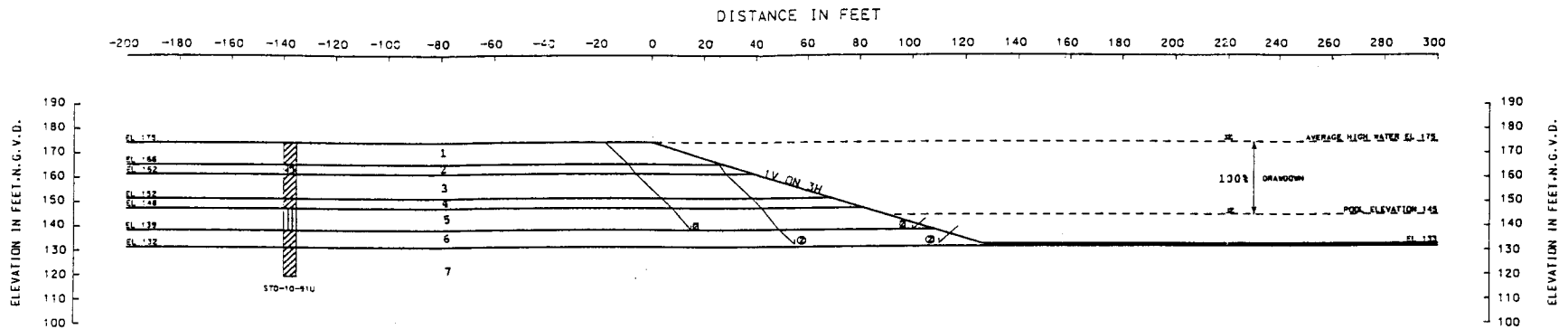
BORING LEGEND

SCALES AS SHOWN

U. S. ARMY ENGINEER DISTRICT, VICKSBURG
CORPS OF ENGINEERS
VICKSBURG, MISSISSIPPI

DATE: 4 FILE NO. X

PLATE NO. 5



DESIGN SOIL PROPERTIES

SOIL NO.	PHI	C (PSF)	GAMMA
1	115	1000	0
2	120	0	30
3	115	1000	0
4	115	750	0
5	115	300	20
6	115	1000	0
7	115	2000	0

STABILITY ANALYSIS
SUDDEN DRAWDOWN CASE

WEDGE NO.	NEUTRAL BLOCK ACTIVE	PASSIVE	ELEV.	SAFETY FACTOR
1	10	100	139	1.68
②	15	100	139	1.68
3	20	100	139	1.70
4	15	95	139	1.68
5	15	105	139	1.69

STABILITY ANALYSIS
AFTER CONSTRUCTION CASE

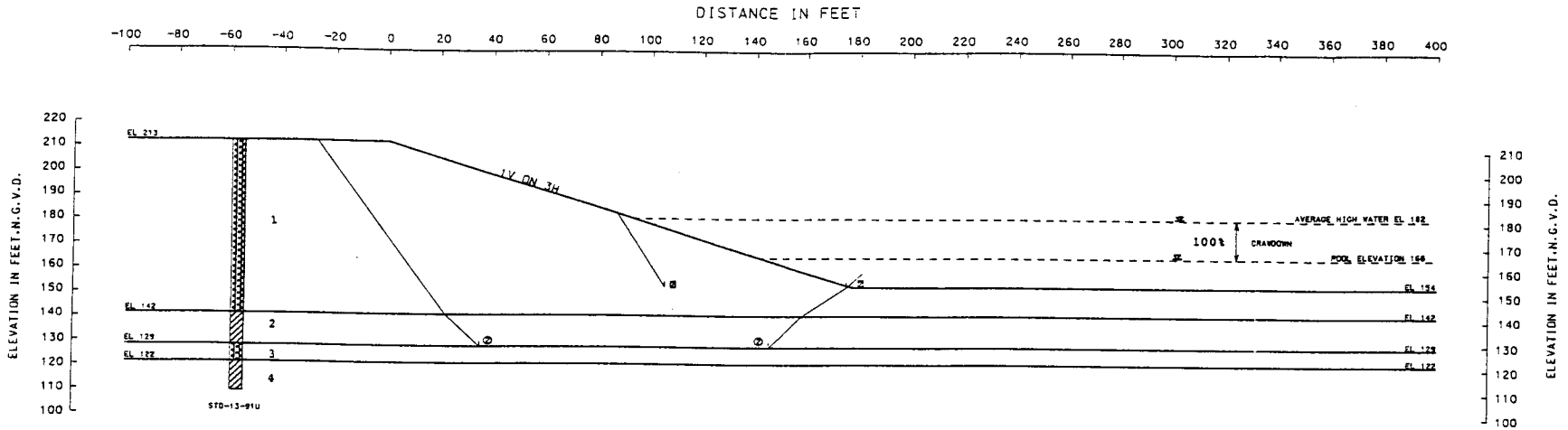
WEDGE NO.	NEUTRAL BLOCK ACTIVE	PASSIVE	ELEV.	SAFETY FACTOR
1	50	110	133	1.37
②	55	110	133	1.29
3	60	110	133	1.36
4	55	105	133	1.31
5	55	115	133	1.29

TWELVE MILE BAYOU

STABILITY ANALYSIS

SCALES AS SHOWN
U. S. ARMY ENGINEER DISTRICT, VICKSBURG
CORPS OF ENGINEERS
VICKSBURG, MISSISSIPPI
DATE: [illegible] FILE NO. X

PLATE NO. 6



DESIGN SOIL PROPERTIES

SOIL NO.	γ (PCF)	C (PSF)	ϕ (DEG)
1	120	0	33
2	115	2000	0
3	120	0	33
4	115	2000	0

STABILITY ANALYSIS
SUDDEN DRAWDOWN CASE

WEDGE NO.	NEUTRAL BLOCK ACTIVE	PASSIVE	ELEV.	SAFETY FACTOR
1	100	170	154	1.28
[2]	105	175	154	1.26
3	110	180	154	1.29
4	105	175	154	1.27
5	105	175	154	1.27

STABILITY ANALYSIS
AFTER CONSTRUCTION CASE

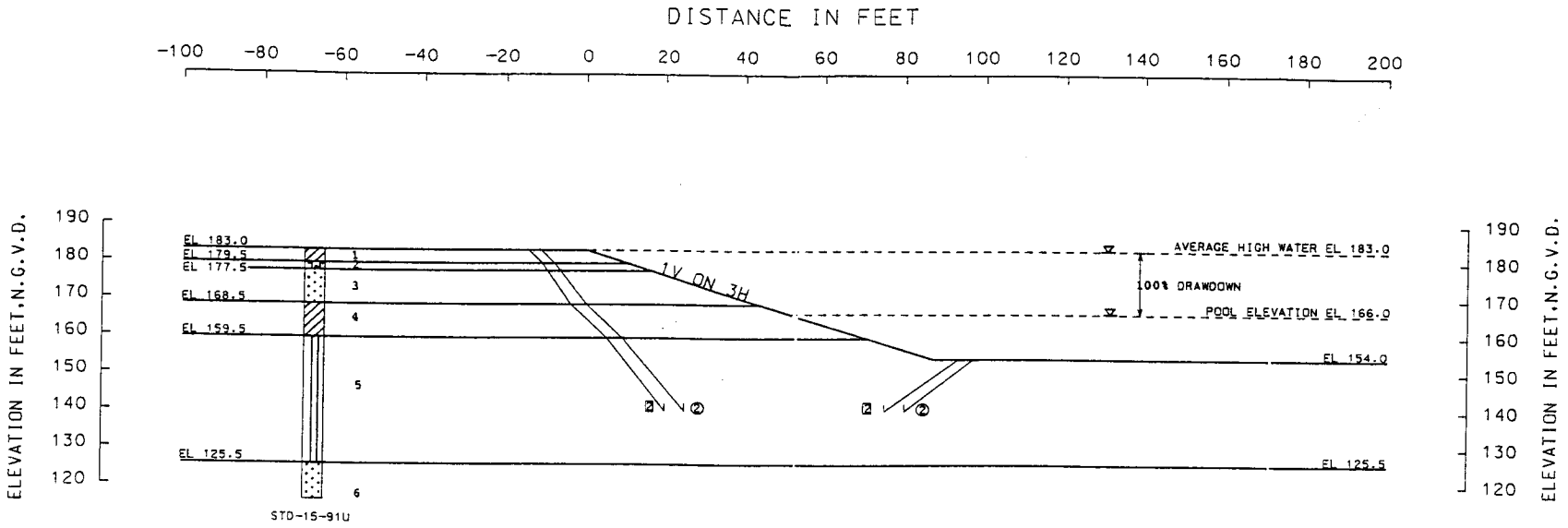
WEDGE NO.	NEUTRAL BLOCK ACTIVE	PASSIVE	ELEV.	SAFETY FACTOR
1	30	145	129	1.76
(2)	35	145	129	1.75
3	40	145	129	1.75
4	35	140	129	1.76
5	35	150	129	1.77

GOOSE PRAIRIE CUTOFF

STABILITY ANALYSIS

SCALES AS SHOWN
U. S. ARMY ENGINEER DISTRICT, VICKSBURG
CORPS OF ENGINEERS
VICKSBURG, MISSISSIPPI
DATE: AS FILE NO. X

PLATE NO. 7



DESIGN SOIL PROPERTIES

SOIL NO.	γ (PCF)	C (PSF)	ϕ (DEG)
1	115	750	0
2	120	0	30
3	120	0	30
4	115	750	0
5	115	300	20
6	120	0	30

STABILITY ANALYSIS
SUDDEN DRAWDOWN CASE

WEDGE NO.	NEUTRAL BLOCK ACTIVE	PASSIVE	ELEV.	SAFETY FACTOR
1	15	75	140	1.31
[2]	20	75	140	1.30
3	25	75	140	1.32
4	20	70	140	1.31
5	20	80	140	1.31

STABILITY ANALYSIS
AFTER CONSTRUCTION CASE

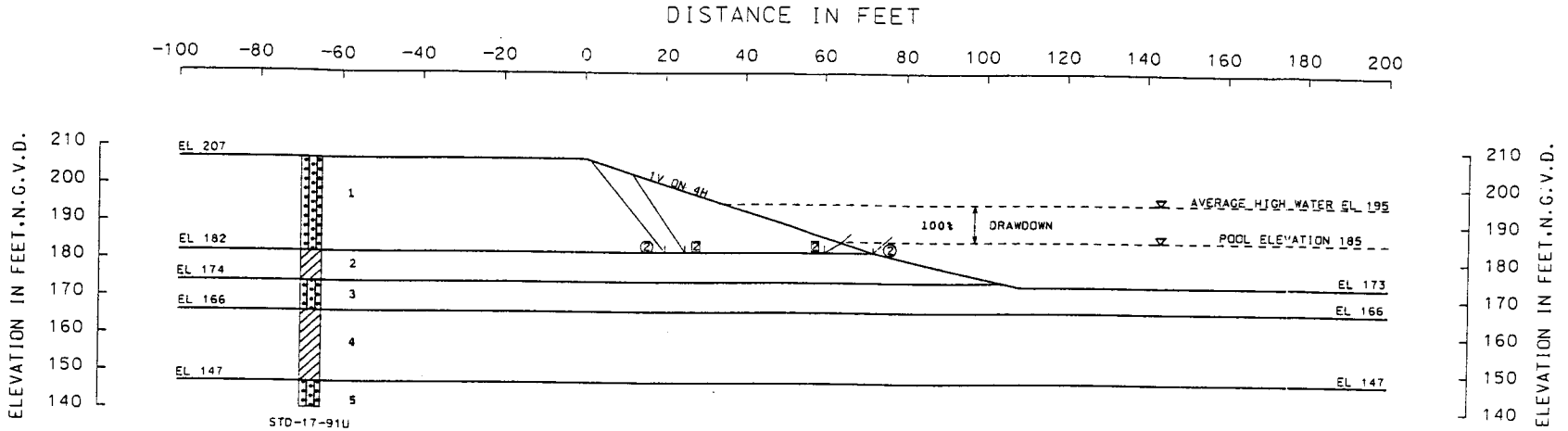
WEDGE NO.	NEUTRAL BLOCK ACTIVE	PASSIVE	ELEV.	SAFETY FACTOR
1	20	80	140	1.78
(2)	25	80	140	1.77
3	30	80	140	1.79
4	25	75	140	1.78
5	25	85	140	1.79

POOL 6

STABILITY ANALYSIS

SCALES AS SHOWN
U. S. ARMY ENGINEER DISTRICT, VICKSBURG
CORPS OF ENGINEERS
VICKSBURG, MISSISSIPPI
DATE: 95 FILE NO. X

PLATE NO. 8



DESIGN SOIL PROPERTIES

SOIL NO.	γ (PCF)	C (PSF)	ϕ (DEG)
1	120	0	30
2	115	2000	0
3	120	0	33
4	115	2000	0
5	120	0	33

STABILITY ANALYSIS
SUDDEN DRAWDOWN CASE

WEDGE NO.	NEUTRAL BLOCK ACTIVE	PASSIVE	ELEV.	SAFETY FACTOR
1	20	60	182	1.23
[2]	25	60	182	1.20
3	30	60	182	1.29
4	25	55	182	1.27
5	25	65	182	1.37

STABILITY ANALYSIS
AFTER CONSTRUCTION CASE

WEDGE NO.	NEUTRAL BLOCK ACTIVE	PASSIVE	ELEV.	SAFETY FACTOR
1	15	70	182	2.13
(2)	20	70	182	2.10
3	25	70	182	2.11
4	20	65	182	2.12
5	20	75	182	2.12

POOL 7

STABILITY ANALYSIS

SCALES AS SHOWN
U. S. ARMY ENGINEER DISTRICT, VICKSBURG
CORPS OF ENGINEERS
VICKSBURG, MISSISSIPPI
DATE: 4-85 FILE NO. x

PLATE NO. 9

TEST DATA SUMMARY

PROJECT SHREVEPORT TO DAINGERFIELD

BORING NO.	SAM. NO.	DEPTH OR ELEV. OF SAMPLE	LABORATORY CLASSIFICATION	MECHANICAL ANALYSIS: GRAVEL %	SAND %	FINES %	D_{10}	ATTERBERG LIMITS: LL	PL	SPECIFIC GRAVITY G	NAT. WATER CONT. %	NATURAL DRY DENSITY LBS/CU FT	COMPACTION DATA: OPT. WATER %	MAXIMUM DRY DENSITY LBS CU FT	SHEAR DATA: INITIAL e	DRY DENSITY LBS/CU FT	W_1 %	W_F %	S_1 %	TYPE TEST	SPECIMEN SIZE INCHES	TEST	σ_m T/SQ FT	σ_1 T/SQ FT	$(t_{ha})_c$ T/SQ FT	ϕ DEGREES	PERMEABILITY: e	K FT/MIN.	CONSOLIDATION DATA: P_O T/SQ FT	P_C T/SQ FT	C_C	t_{50}	REMARKS
STD-3-9W																																	
	7A	30'-31'	BR (CH) W/SL SIS LG					77	18	2.72					.780	95.36			100	UCT	2.99 x 1.34				920								
	8A	35'-36'	BR CLAY (CH) W/SL CC RT					69	20	2.72					.742	97.42			100	UCT	2.99 x 1.35				1360								
																									760								
STD-4-9W																																	
	4A	15'-16'	BR CLAY (CH) W/S/S					43	14	2.72					.710	99.19			1021	UCT	2.99 x 1.33				580								
STD-5-9W																																	
	2A	5'-6'	GR CLAY (CH) W/SIS/RT					75	24	2.72					.710	99.25			95.23	UCT	2.99 x 1.35				3230								
STD-7-9W																																	
	2A	5'-6'	BR CLAY (CH) W/SISS SL CC RT					64	21	2.72					.679	101.07			98.35	UCT	2.99 x 1.34				1710								
	3A	10'-11'	BR CLAY (CH) W/SL					58	17	2.72					.633	103.91			100.00	UCT	2.99 x 1.34				1510								
STD-8-9W																																	
	2A	5'-6'	BR CLAY (CH) W/SL RT CC SIS					60	18	2.72					.681	100.98			97.01	UCT	2.99 x 1.35				1810								
	3A	10'-11'	BR CLAY (CH) W/SISA CC SL					68	18	2.72					.698	99.95			100.00	UCT	2.99 x 1.35				1700								
	4A	15'-16'	GR BR CLAY (CH) W/SL CC					64	19	2.72					.759	96.48			100.00	UCT	2.99 x 1.35				660								
	4B	"	"												.766	96.12			100.00	UCT	2.99 x 1.35				690								
STD-9-9W																																	
	2A	5'-6'	BR GR CLAY (CH) W/SIS SL OX					72	18	2.72					.706	99.51			100.00	UCT	2.99 x 1.35				1180								
	3A	10'-11'	GR BR CLAY (CH) W/SIS SL CL					56	16	2.72					.731	98.05			97.17	UCT	2.99 x 1.36				950								
	4A	15'-16'	BR GR CLAY (CH) W/SIS SL RT					74	21	2.72					.910	88.86			100.00	UCT	2.99 x 1.37				560								
	4B	"	"												.954	88.86			100.00	UCT	2.99 x 1.35				690								
STD-10-9W																																	
	2A	5'-6'	GR BR CLAY (CL) W/SIS					44	15	2.72					.656	102.49			92.27	UCT	2.99 x 1.35				1070								
	4A	15'-16'	BR GR CLAY (CL) W/SL					64	22	2.72					.893	89.85			100.00	UCT	2.99 x 1.36				710								
	5A	20'-21'	GR BR CLAY (CH) W/SIS SL RT CC					65	20	2.72					.802	94.19			98.63	UCT	2.99 x 1.35				1280								

ENG FORM 2086 EDITION OF 1 MAR 58 IS OBSOLETE. (EM 1110-2-1906)
1 JAN 73

T – TRIAXIAL COMPRESSION
UC – UNCONFINED COMPRESSION
DS – DIRECT SHEAR
Q – UNCONSOLIDATED UNDRAINED
S – CONSOLIDATED DRAINED
R – CONSOLIDATED UNDRAINED

PLATE NO. 10

TEST DATA SUMMARY

PROJECT _____

BORING NO.	SAM. NO.	DEPTH OR ELEV. OF SAMPLE	LABORATORY CLASSIFICATION	MECHANICAL ANALYSIS				ATTERBERG LIMITS		SPECIFIC GRAVITY G	NAT WATER CONT. %	NATURAL DRY DENSITY LBS/CU FT	COMPACTION DATA		SHEAR DATA											PERMEABILITY		CONSOLIDATION DATA				REMARKS
				GRAVEL %	SAND %	FINES %	D_{10}	LL	PL				OPT WATER %	MAXIMUM DRY DENSITY LBS/CU FT	INITIAL e	DRY DENSITY LBS/CU FT	W_1 %	W_p %	S_1 %	TYPE TEST	SPECIMEN SIZE INCHES	TEST	σ_m T/SQ FT	σ_1 T/SQ FT	$\frac{1}{2}(\sigma_1 - \sigma_3)$ T/SQ FT	ϕ DEGREES	e	K FT/MIN.	P_O T/SQ FT	P_C T/SQ FT	C_C	t_{50}	
STD-11-9[illegible]																																
	4A	15'-16'	GR BR CLAY (CH) W/SIS SL KT					77	22	2.72					.743	97.36				UCT	2.99 x 1.36					1850							
	5A	20'-21'	GR BR CLAY (CH) W/SIS CG					69	18	2.72					.693	100.28				UCT	2.99 x 1.37					1600							
	7A	30'-31'	GR BR CLAY (CH) W/SIS OX					83	23	2.72					.837	92.41				UCT	2.99 x 1.35					1810							
STD-16-9[illegible]																																
	5A	20'-21'	R GR CLAY (CH) W/SIS SS CG					53	13	2.72					.744	122.55				UCT	2.99 x 1.3					1370							
	6A	25'-26'	R BR CLAY (CH) W/SIS CG					72	22	2.72					.815	93.51				UCT	2.99 x 1.34					2380							
	7A	30'-31'	BR GR CLAY (CH) W/SIS SL					67	22	2.72					.859	91.28				UCT	2.99 x 1.35					1530							
STD-18-9[illegible]																																
	6A	25'-26'	GR CLAY (CH) W/SIS SS					34	15	2.72					.561	108.75				UCT	2.99 x 1.38					940							
STD-24-9[illegible]																																
	6A	25'-26'						56	30	2.72					.864	91.08				UCT	2.99 x 1.39					830							

ENG FORM 2086 EDITION OF 1 MAR 58 IS OBSOLETE. (EM 1110-2-1906)
1 JAN 73

T – TRIAXIAL COMPRESSION
UC – UNCONFINED COMPRESSION
DS – DIRECT SHEAR
Q – UNCONSOLIDATED UNDRAINED
S – CONSOLIDATED DRAINE
R – CONSOLIDATED UNDRA

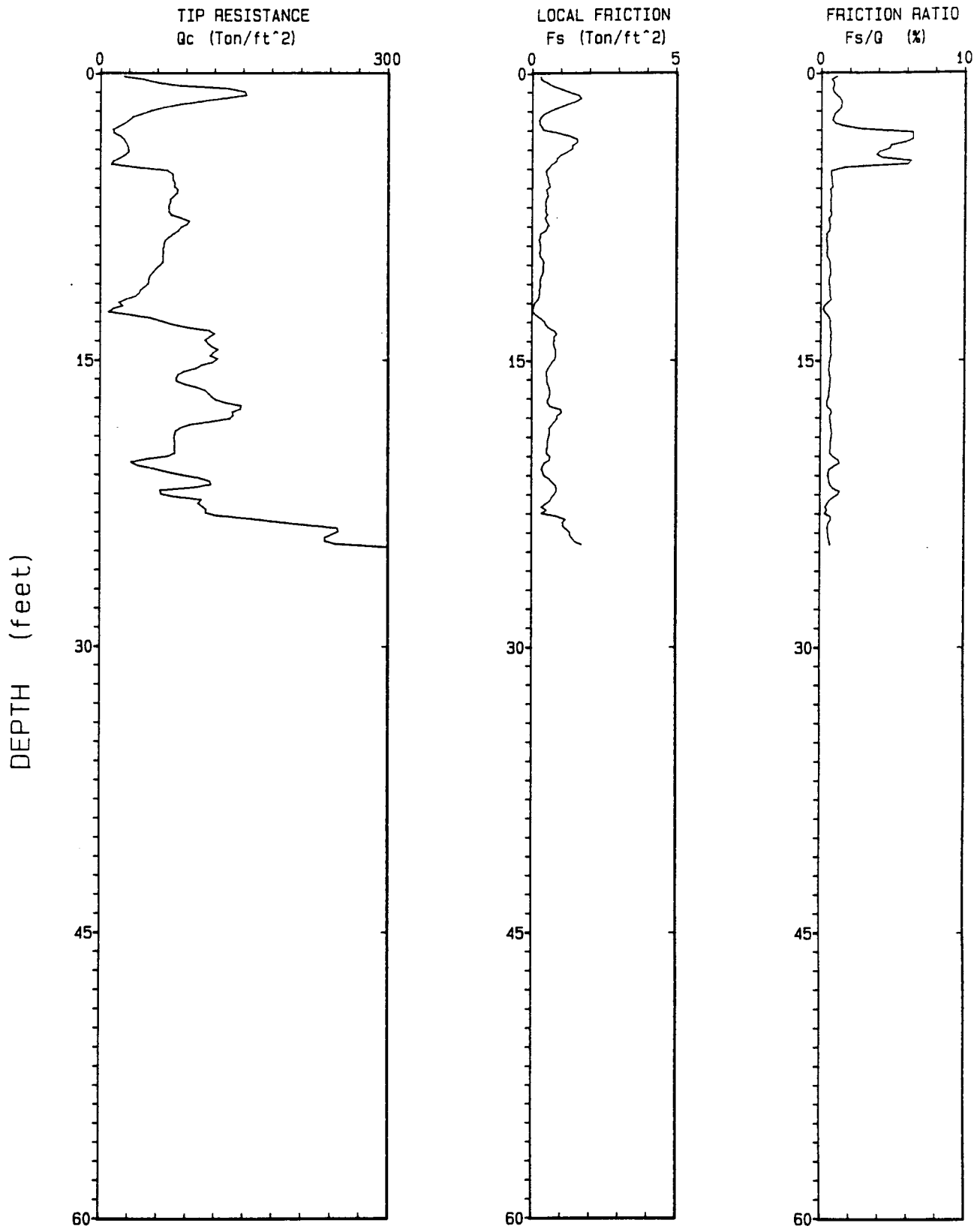
PLATE NO. 11

APPENDIX

USAED Vicksburg

Project: JEFFERSON
ELEV. 189.55
Cone No.: 342

Date: 12-02-92
Hole No.: CJ-1-92.STD
Location: AS SHOWN ON MAP



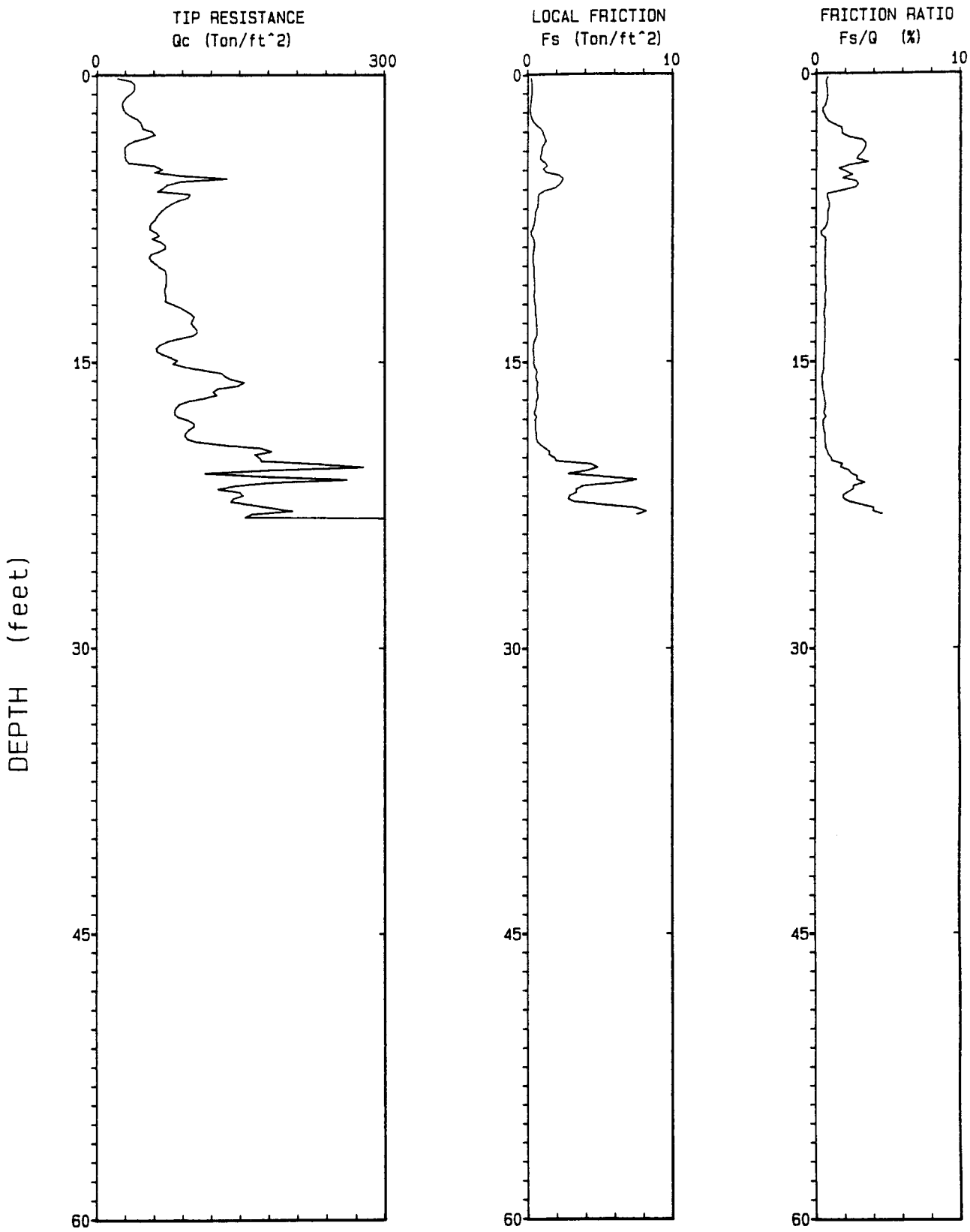
Depth Increment : .05 m

Max Depth : 24.93 ft

USAED Vicksburg

Project: JEFFERSON
ELEV. 188.4
Cone No.: 342

Date: 12-02-92
Hole No.: CJ-2-92.STD
Location: AS SHOWN ON MAP



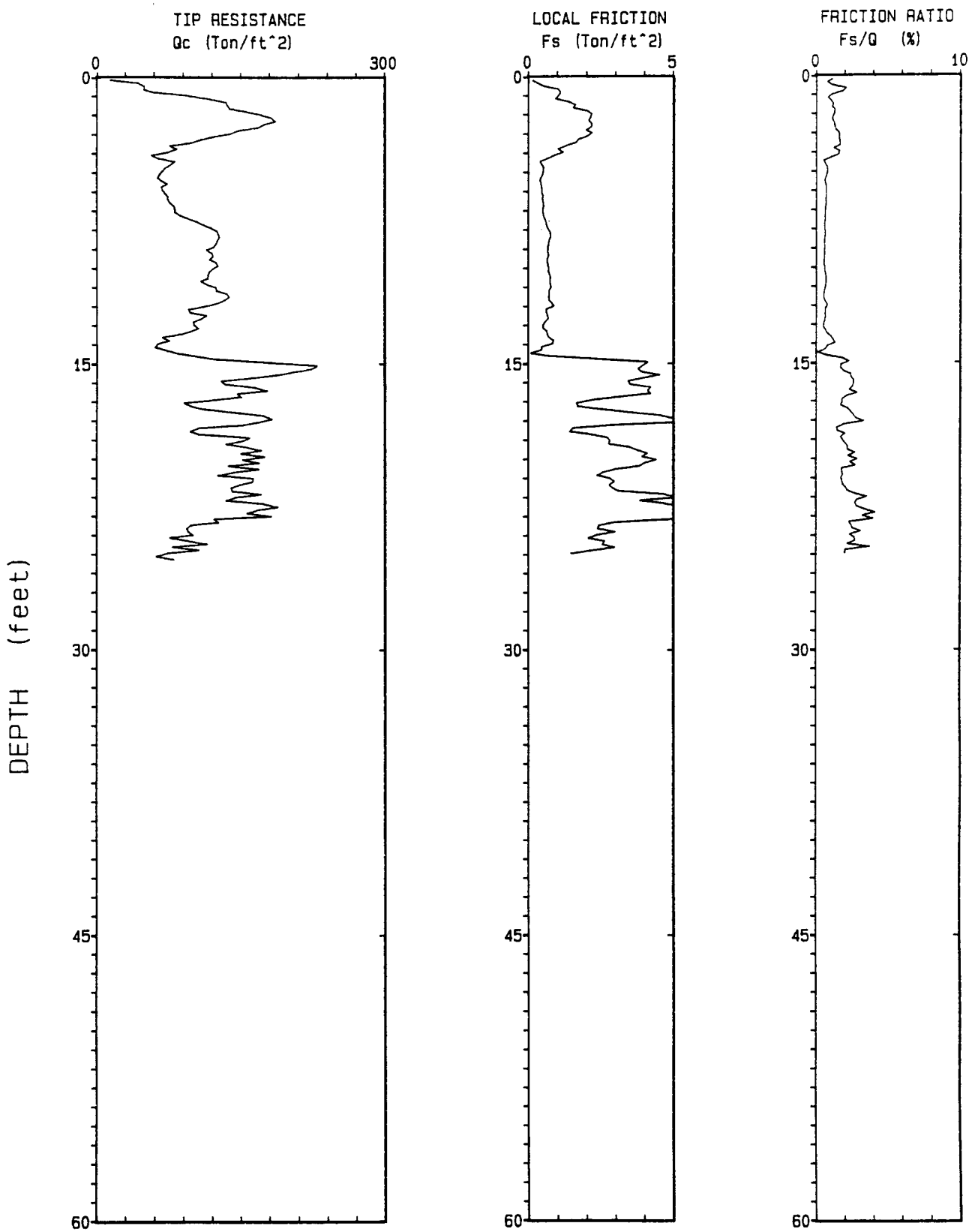
Depth Increment : .05 m

Max Depth : 23.29 ft

USAED Vicksburg

Project: JEFFERSON
ELEV. 186.71
Cone No.: 342

Date: 12-02-92
Hole No.: CJ-3-92.STD
Location: AS SHOWN ON MAP



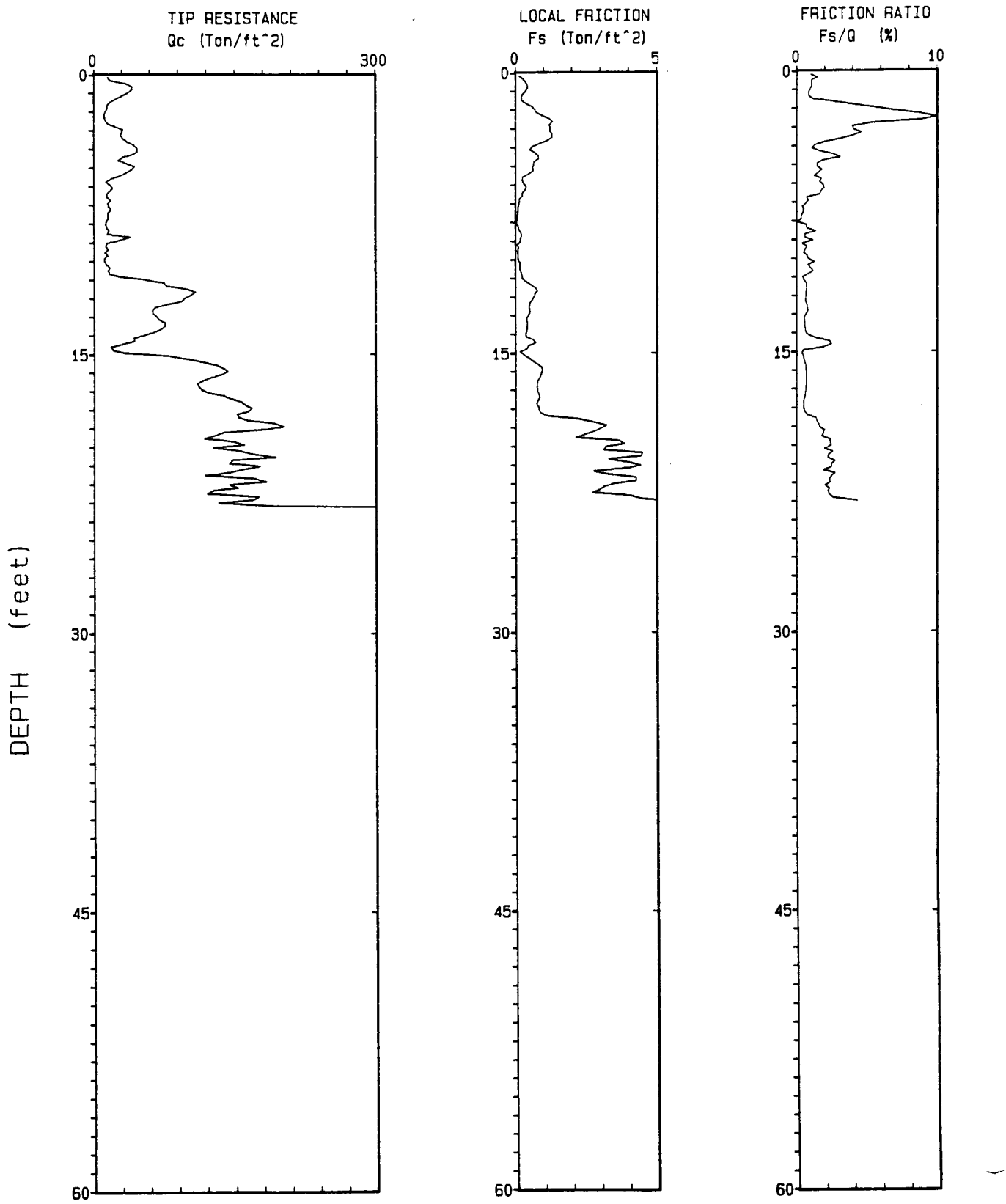
Depth Increment : .05 m

Max Depth : 25.26 ft

USAED Vicksburg

Project: JEFFERSON
ELEV. 191.64
Cone No.: 342

Date: 12-02-92
Hole No.: CJ-4-92.STD
Location: AS SHOWN ON MAP



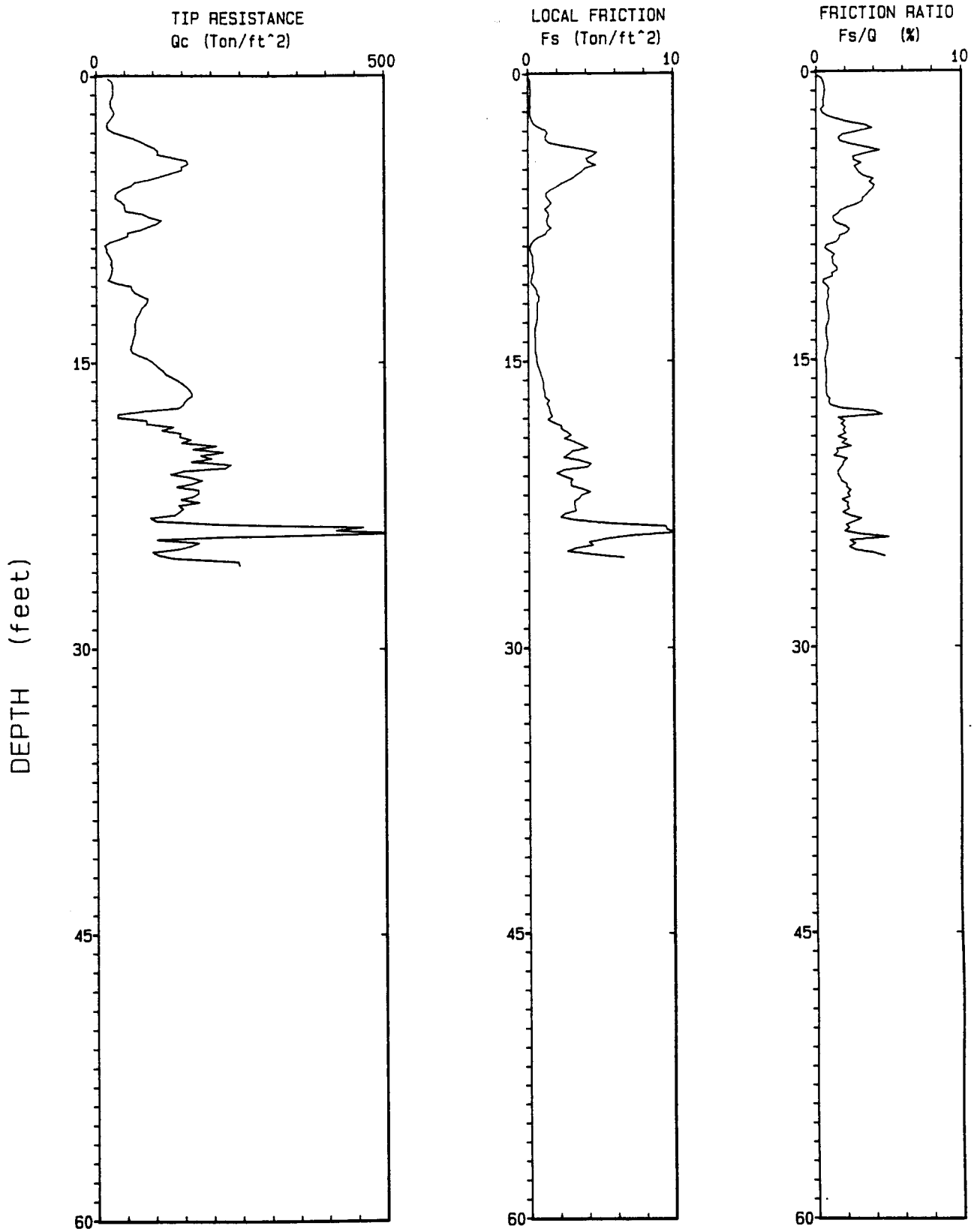
Depth Increment : .05 m

Max Depth : 23.29 ft

USAED Vicksburg

Project: JEFFERSON
ELEV. 195.46
Cone No.: 342

Date: 12-02-92
Hole No.: CJ-5-92.STD
Location: AS SHOWN ON MAP



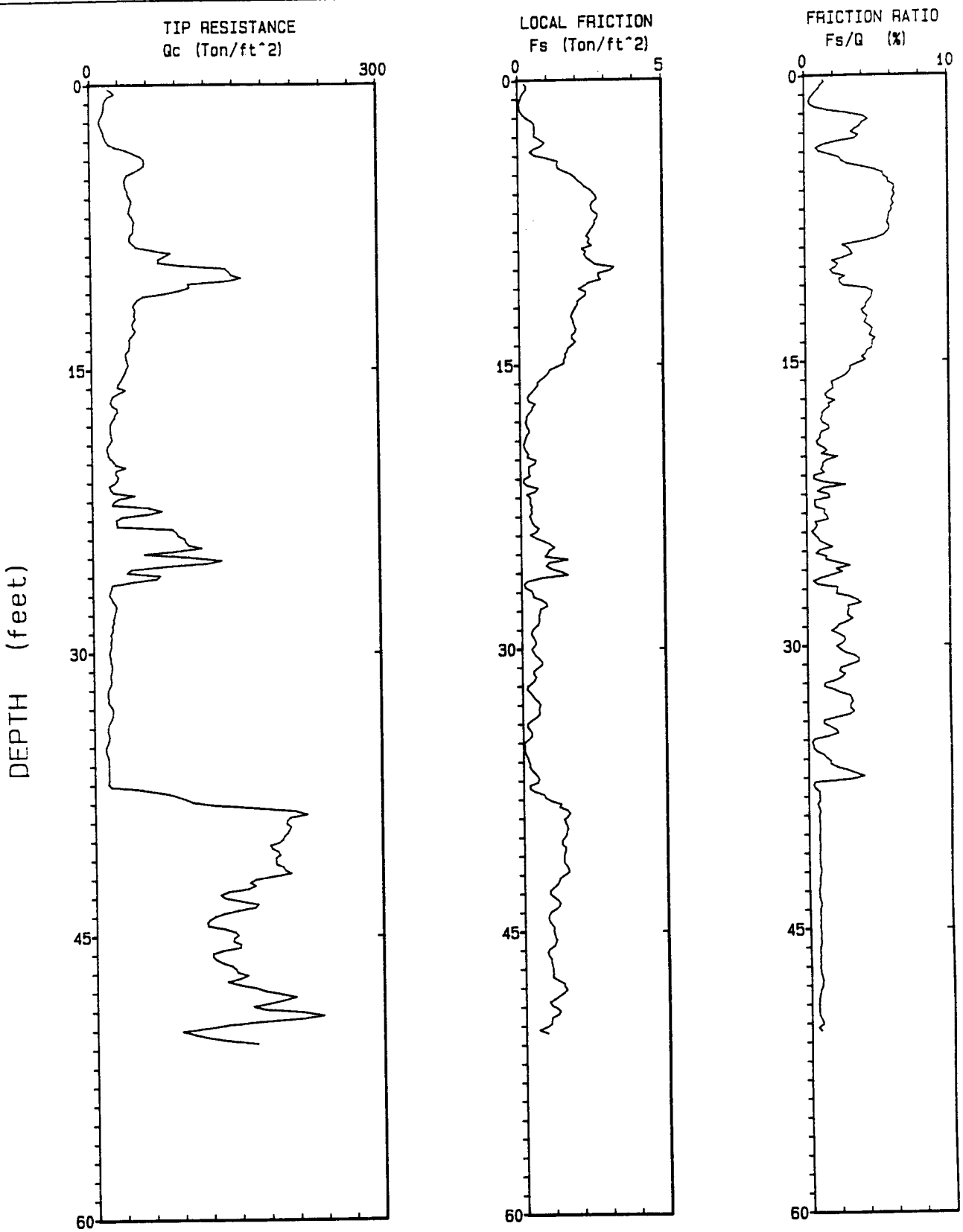
Depth Increment : .05 m

Max Depth : 25.59 ft

USAED Vicksburg

Project: LAKE OF PINES
ELEV. 243.97
Cone No.: 342

Date: 12-01-92
Hole No.: CP-1-92.STD
Location: AS SHOWN ON MAP



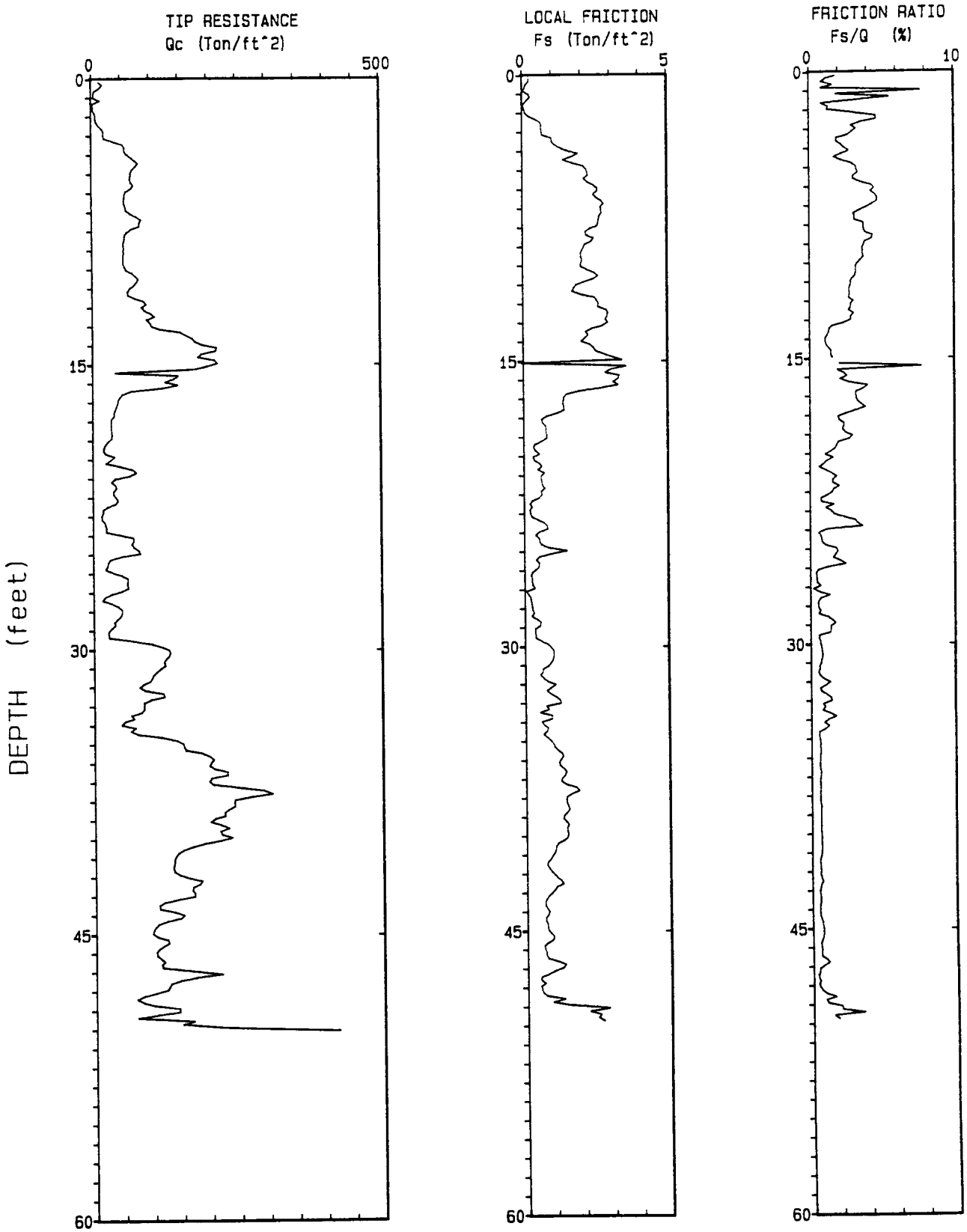
Depth Increment : .05 m

Max Depth : 50.69 ft

USAED Vicksburg

Project: LAKE OF PINES
ELEV. 242.19
Cone No.: 342

Date: 12-01-92
Hole No.: CP-2-92.STD
Location: AS SHOWN ON MAP



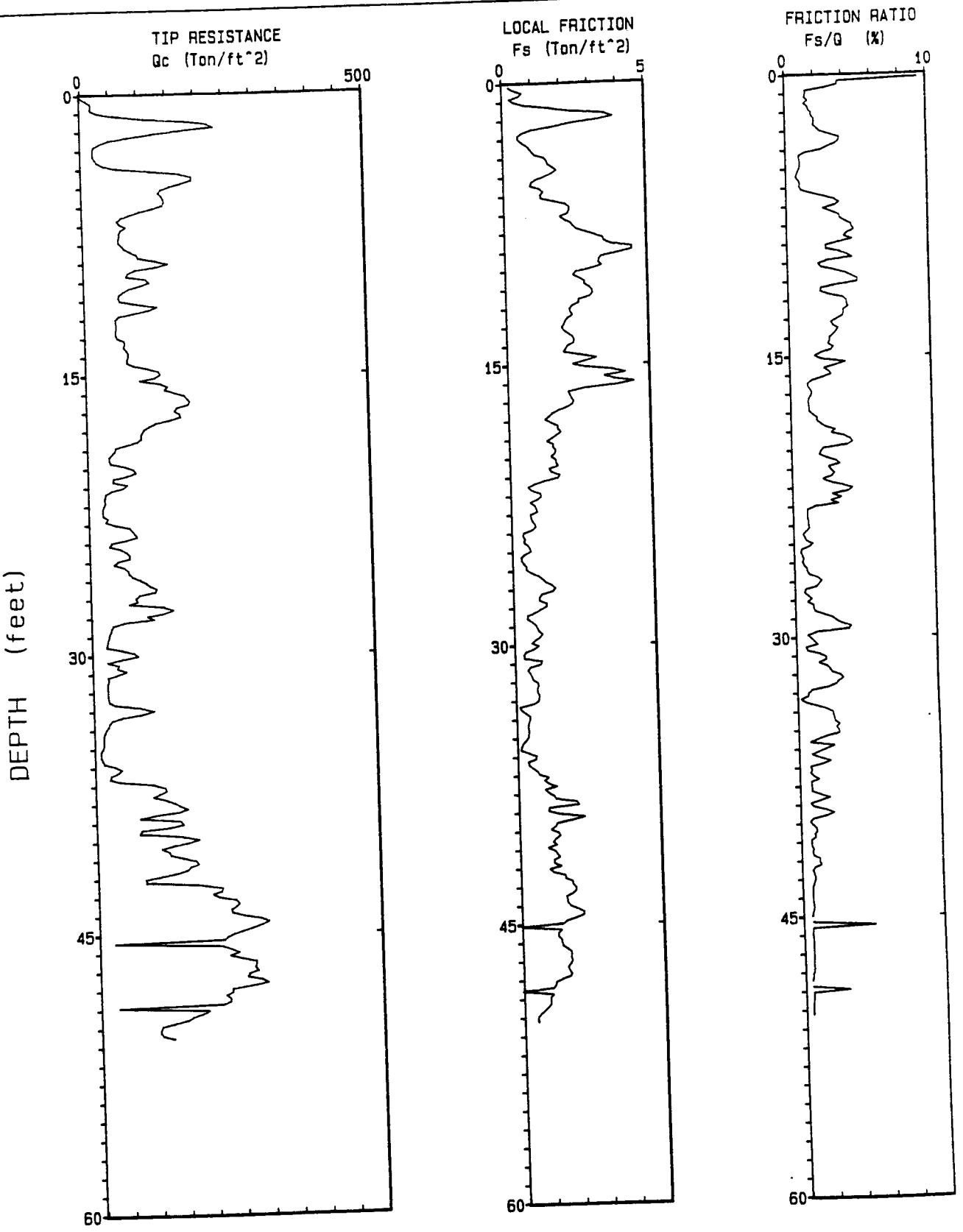
Depth Increment : .05 m

Max Depth : 50.03 ft

USAED Vicksburg

Project: LAKE OF PINES
ELEV. 247.70
Cone No.: 342

Date: 12-01-92
Hole No.: CP-3-92.STD
Location: AS SHOWN ON MAP



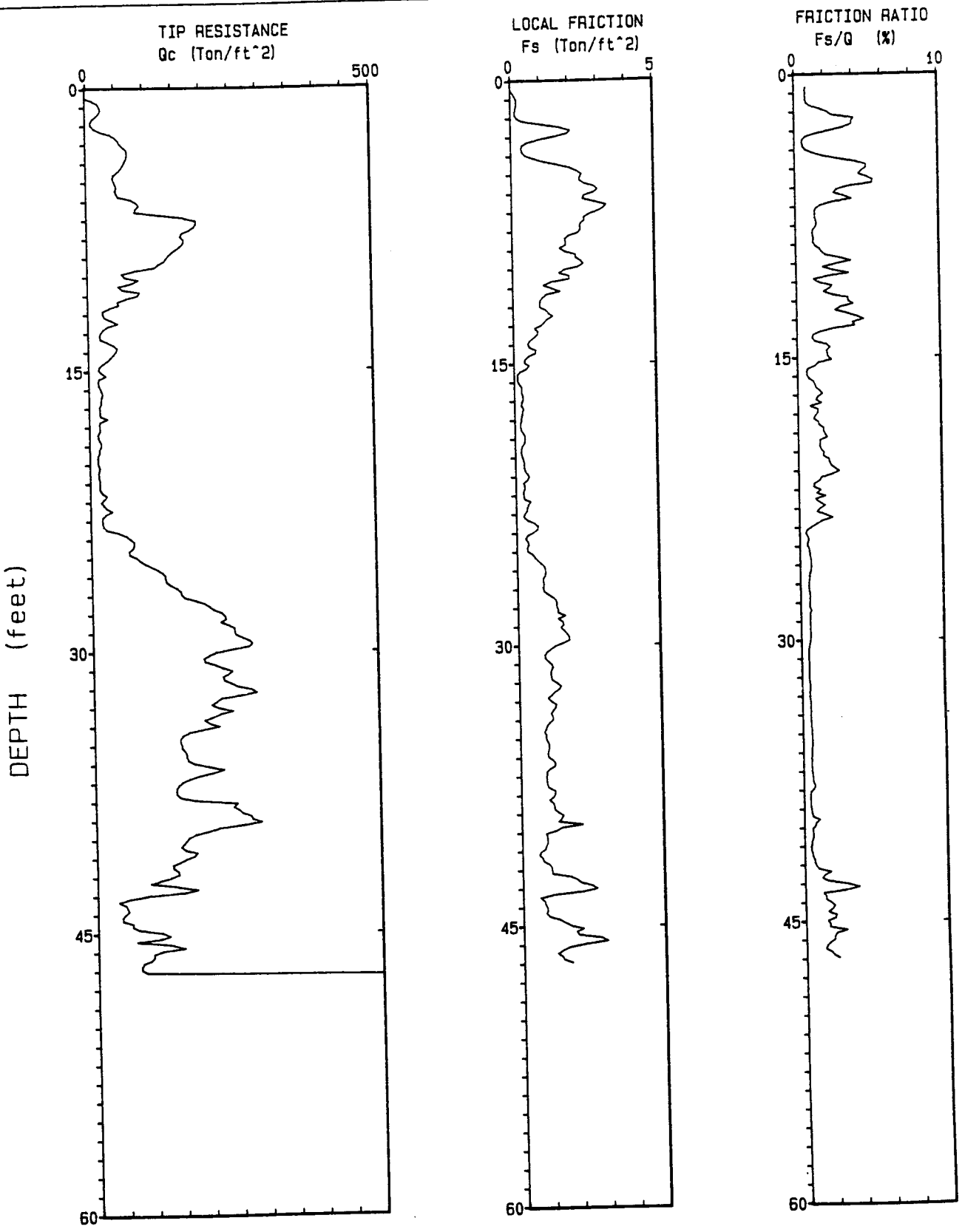
Depth Increment : .05 m

Max Depth : 50.52 ft

USAED Vicksburg

Project: LAKE OF PINES
ELEV. 239.55
Cone No.: 342

Date: 12-01-92
Hole No.: CP-4-92.STD
Location: AS SHOWN ON MAP



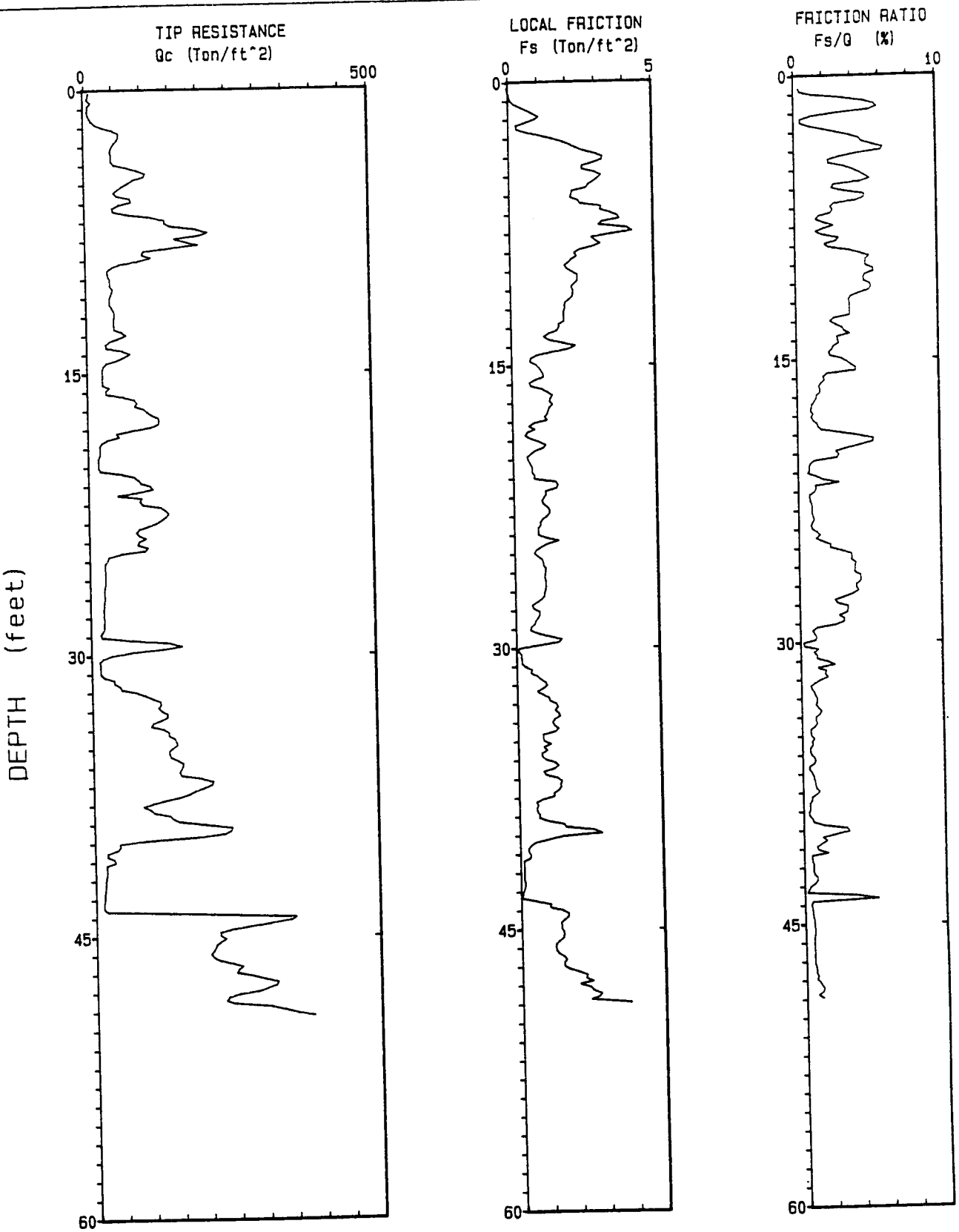
Depth Increment : .05 m

Max Depth : 47.24 ft

USAED Vicksburg

Project: LAKE OF PINES
ELEV. 244.80
Cone No.: 342

Date: 12-01-92
Hole No.: CP-5-92.STD
Location: AS SHOWN ON MAP



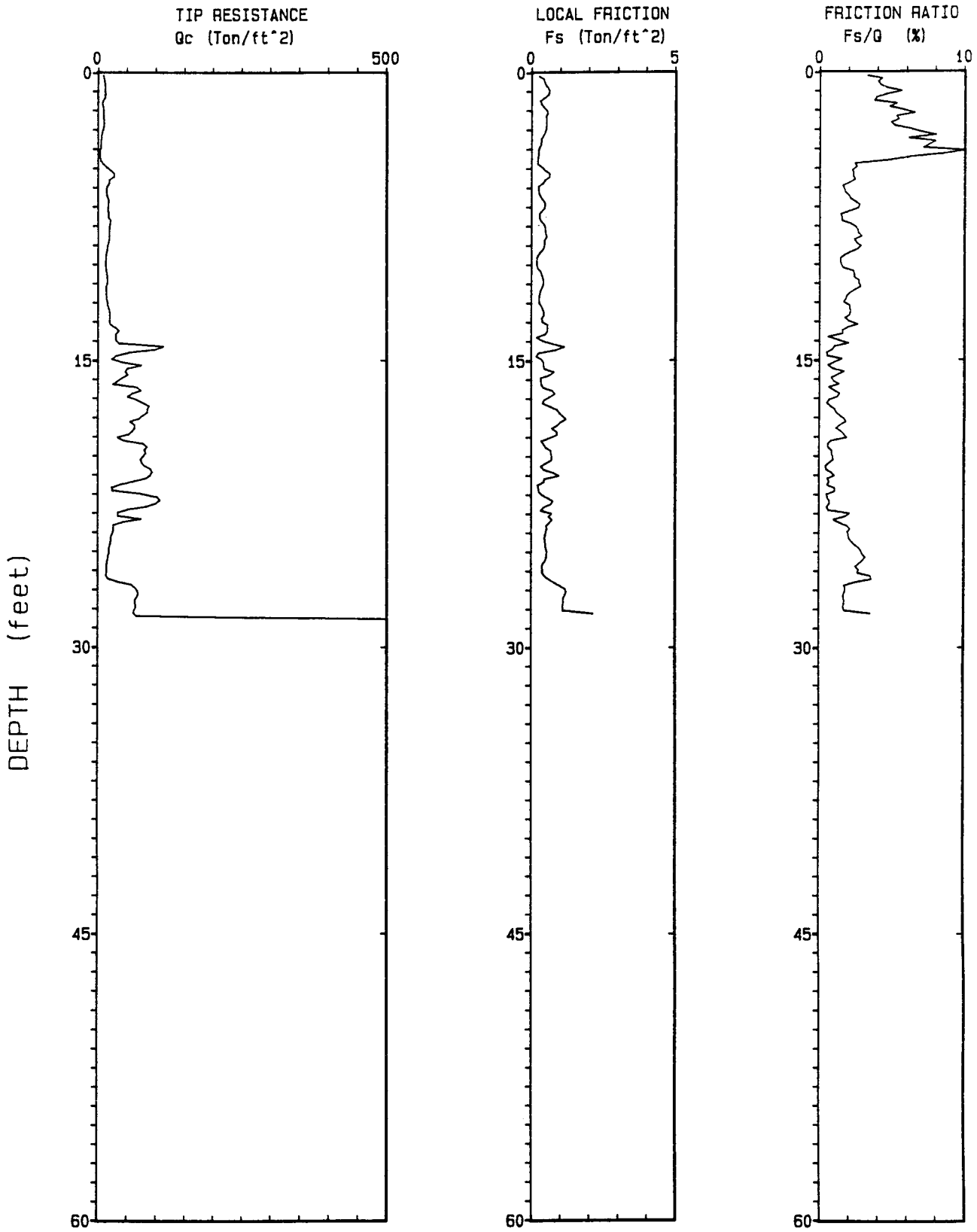
Depth Increment : .05 m

Max Depth : 49.21 ft

USAED Vicksburg

Project: CADDO
ELEV. 166.36
Cone No.: 342

Date: 12-02-92
Hole No.: C-1-92.STD
Location: AS ON MAP



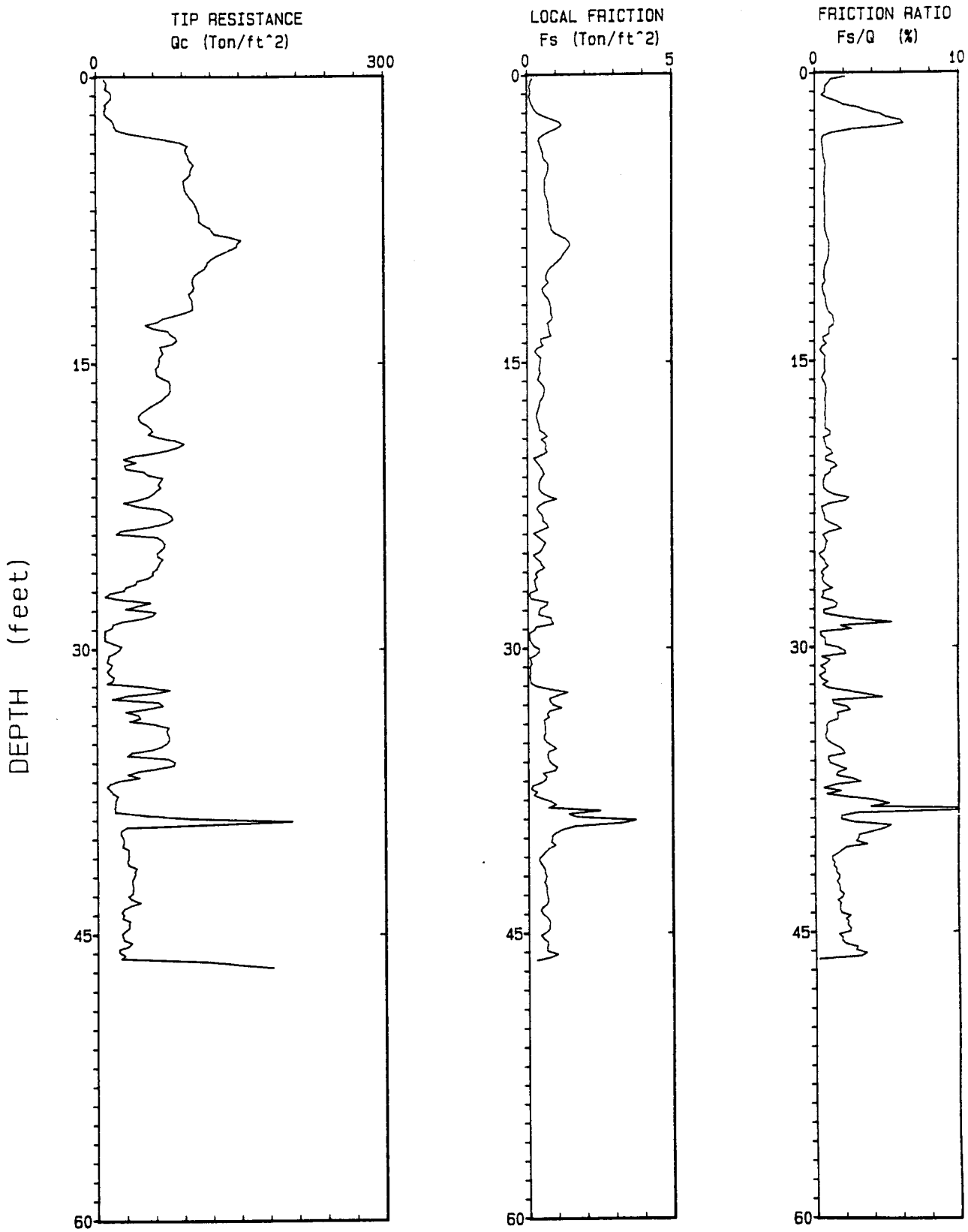
Depth Increment : .05 m

Max Depth : 28.54 ft

USAED Vicksburg

Project: CADD0
ELEV. 173.29
Cone No.: 342

Date: 12-02-92
Hole No.: C-2-92.STD
Location: AS SHOWN ON MAP



Depth Increment : .05 m

Max Depth : 46.75 ft